RESEARCH ARTICLE

COVID-19 challenges and firm responses: Analysis of a city-wide census in a developing country

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We use the unique data set of 16,300 firms' responses for the large-scale census survey in an urban area at Ho Chi Minh City (Vietnam) to study how firms perceived their problems and responded to during the COVID-19 pandemic. We provide estimates of 65 cross-associations between a firm's challenges during the pandemic and their responses. We find several firm characteristics that suggest increased likelihood of pandemic response, including some, such as state ownership, which are typically associated with being slow to respond to market conditions. A theoretical model is posited that matches with the rapidly declared survey response.

JEL CLASSIFICATION
R10, R39, R51

1 | INTRODUCTION

The COVID-19 pandemic in 2020 has become not only a health crisis but also an even larger economic disaster than the financial crisis of 2008. There are numerous economic responses from governments such as offering direct aid, cutting down the interest rate, and access to cheaper credit for corporations, individuals, and banks (Demertzis et al., 2020; Sharma et al., 2020). Currently, it is too early to evaluate the effectiveness of most current policy responses in the economy; however, the understanding of the current problems and challenges which firms have been facing is a sensible requirement for the delivery of better policy implications. At the same time, examining how firms respond to the unprecedented event would offer insights for not only scholars regarding firms' behaviors but also policymakers to understand potential and timely stimulus from their needs. Firms are more likely to engage in wage cuts (Meyer et al., 2021), investment reduction (Buchheim et al., 2020), and innovative accelerated development (Ahlstrom & Wang, 2021). Survey data are critical for determining the status of the economy and the appropriate government response, particularly when more objective measures (like gross domestic product [GDP] data) may not be timely. This is one of our main motivations to carry out this research.

The extant literature explains how the economic meltdown followed the onset of COVID-19 in advanced economies such as the United States and the United Kingdom.[1] Although developing countries have taken several sensible and proper actions to mitigate the infected cases, their economies have also experienced a dramatic downturn. To give an idea of the magnitude of these losses, Abiad et al. (2020) revealed that developing Asian countries, already excluding the People's Republic of China, lost approximately $42.243 billion. These numbers illustrate the extent of the pandemic recession. Our country of focus, Vietnam, has been highlighted as having several sequential and timely actions (Huynh, 2020) to minimize the adverse effects on the small economy, but the severity of the pandemic suggests there will be challenges ahead in meeting development goals (United Nations, 2020). Although this developing country imposed a severe lockdown, which was expected to negatively influence economic growth (NEU, 2020), the local and international media have strong optimism for its' economic recovery (Mandhana & Le, 2020; Reed & Chung, 2020). However, while there is an increasing number of studies on the impacts of the pandemic on developed countries, individual developing countries still lack appropriate reference material for their unique and heterogeneous economic conditions. Since each government has already adopted different responses from country to country, it seems impossible to provide a general prescription for rapid recovery, raising the value of rapid data collection such as survey data. We provide such an analysis of a large-scale census survey of firm-level data. We investigate the following key policy and academic questions: (1) What are the primary complaints by firms during the pandemic? and (2) which

types of responses do firms engage in to cope with the specific problem during the pandemic?

The current literature highlights a concern about the mistargeting of policies and their effectiveness in dealing with the COVID-19 shocks (Cirera et al., 2021). The existence of COVID-19 triggers an economic paradox for business. Accordingly, firms are likely to face budget constraints in this difficult time, which impedes any innovation and research investment. However, if they want to survive, they often need to upgrade or change their business models to a more e-commerce orientation, which is a nontrivial expenditure Guderian et al. (2021). Different firms might choose different responses to COVID-19 depending on firm sizes, sectors, and management operations (Grover & Karplus, 2021). Although there are some cross-country studies about firms' responses (Apedo-Amah et al., 2020; Beck et al., 2020), the understanding of Vietnam is still limited by a lack of data. With temporary closures in Feburary and March (2020) and lockdowns ongoing as of June of 2021, this study makes a timely examination of firm problems.

At the same time as firms are responding, researchers are examining the effects within households. Preece et al. (2021) identify that pressures have increased in smaller homes and altered urban rhythms. Buffel et al. (2021) identify that the pandemic is exacerbating existing inequalities, particularly those related to age and other marginalizing factors. These problems can be worsened by changes in employment status.

This paper examines the self-reported measures of firm challenges during COVID-19 using a detailed government-issued census survey representing the complete corpus of all 16,300 firms in HCMC. By using the survey to not only asking the firms' problems but also collect firm responses, we match the firms' problem and their solutions to examine what and how they cope with this shock in their business operation. This extremely detailed firm-level data are distinct from several preexisting studies on COVID-19 response in developing countries (Apedo-Amah et al., 2020; Beck et al., 2020; Borino et al., 2021; Paunovíc & Anïcíc, 2021).

More interestingly, this study also sheds further light on the association between firms' characteristics, their particular complaints, and their specific responses during COVID-19 times. Since Vietnam is an emerging market with a diversity of firm types (for instance, private domestic, central state-owned enterprises [SOEs], local SOEs, and foreign-owned firms, Pham, 2020), this study includes several major firm types that are common to other developing countries in the region. This cross section of firms would not be similar if the study was conducted in a developed country.

Our study has three main findings. First, there is a contrasting picture of SOE and high-revenue firms. One might anticipate they are less agile to respond to COVID-19 shocks (Chen & Hambrick, 1995; Song et al., 2011); however, we found that these firms are more likely to declare they have a response in this survey. This is in line with the idea that these firms are attempting to present well and avoid scrutiny. Second, we outline a theory of firm responses based on the marginal likelihood of government intervention. To this end, we find SOE and larger firms are significantly more likely to declare they have

responded in nearly every specification, which in our theory is associated with anticipating having influence on forthcoming policies. Third, we examined the association between all six types of responses (changing product, e-commerce, new product markets, new input markets, training labor, and "other" responses) and 11 specific firms' complaints regarding their business shocks while controlling for other firm characteristics. Therefore, this paper contributes detailed empirical evidence about firm features, firm complaints, and firm responses to the ongoing literature of organization behaviors in developing countries during the pandemic.

The remainder of this paper is organized as follows. Section 2 describes the survey and the background behind the survey deployment. Section 3 describes some of the anticipated results, particularly that SOE and larger firms will increase complaints in anticipation of provoking a government response. Section 4 will examine the unique data set with district level of firms' responses in Ho Chi Minh City. We discuss the origins of the survey, the involved parties, and the aftermath of the survey. Section 5 explains the standard empirical methodologies that we used in this work. Then Section 6 summarizes our main findings, discussing the association between each of the available firm complaints, firm characteristics, and the heterogeneous responses issued by each firm. Eventually, we conclude our study by addressing some policy implications and future research in Section 7.

2 | BACKGROUND

2.1 | Survey and surrounding context

The People's Council asked the General Statistics Office to collect insights into the damages to Vietnamese enterprises over the pandemic period. Officially, the survey is to "evaluate the effectiveness of policies and support solutions issued by the government at all levels." The City Statistics Department was directed to collect the impacts of COVID-19 pandemic on firms' performance. Since a statistical survey happens annually, the statistics department had the total firms database already. So, they designed the questionnaire focused on the COVID-19 impacts to answer the people's council requests. Information about the survey and login information was distributed to all firms through the portal https://thongkedoanhnghiep.gso.gov.vn/Login.aspx for firm information. Then, the new questionnaires were updated onto the system for firms to answer.

The survey itself was then distributed at the open web portal: http://ctkhcm.hcmcso.gov.vn/ on April 1, 2020. This web portal was used by the city statistics office to announce the latest information and identify which firms which have not yet completed the survey. Firms were notified by email that they would be able to respond. Firms had to use their tax code as a username, while collecting their passwords from this website. Once logged in, they change their password and can complete their survey. Password resets were available from the General Statistics Office in HCMC.

Simultaneously, this survey also serves as a way for firms to communicate their concerns to the government and potentially influence

policy. Several policies, such as tax reform, were likely to be altered by the government during this time period, and forward-thinking firms are likely aware of the impact their response may have. Firms may, to some extent, exaggerate or minimize the extent of their difficulties in order to seem appealing to the government and potential regulators.

Such analysis is vital since most firms will not release information about their challenges unless prompted. For example, in the United States, only 21% of firms mention COVID-19 during their tax filings (Loughran & McDonald, 2020). Prior to the pandemic, only 19% mentioned such a risk (Theile et al., 2020)—suggesting that firms are incredibly reluctant to release information on obstacles. These disclosures are centered around the tourism and airline industries—where travel is vital (Larcker et al., 2020).

In general, COVID-19 in Vietnam was seen as under control in 2020, at least compared to 2021. (Vu & Tran, 2020) A stimulus package was passed, but uptake was low (The Socialist Republic of Vietnam, 2020c). Only 2.9% of enterprises have officially received support; 21.2% of enterprises know about the stimulus and have been guided but have not yet implemented it; 64.6% of enterprises know about the stimulus but are unsure of how to approach the policy; 11.4% of enterprises state they do not know about the policy (Vietnam General Statistics Office, 2020). We also recommend Huynh (2020) for further details on changes prior to 2020.

Ultimately, the data were released on June 15, 2020.

2.2 | Responses to coronavirus and to survey data

On the same day, the data were released (June 15, 2020), and the City Statistics Department had a meeting with the Economic - Budget Committee of the People's Council. The City Statistics Department released the results of the survey to assess the impact of the COVID-19 pandemic on the city's economy and the evolution of the consumer price index (CPI) in the first 5 months of the year. This meeting was intended to report the results to the People's Committee and to prepare and plan for a follow-up survey (HCMC City Statistics Department, 2020). The second wave of survey results have been performed but have not been released at the time of publication.We outline a many of the changes implemented after the survey below.

Though it is not always possible to draw an explicit causal link between public policy and its instigating factors, a little over 2 months after the release of the survey (August 16, 2020), the People's Committee of HCMC passed an extensive series of mandates that provided extensive aid to firms in HCMC. We highlight several of these changes below (HCMC People's Committee, 2021b).

First, they implemented traditional monetary policy, asking the state bank to support loans and directing credit institutions to the state bank; see policies of State Bank of Vietnam (2020) and State Bank of Vietnam (2021). Several organizations are eligible for 0% interest loans. These loans are intended for worker payroll when those workers are unable to work due to COVID-19 (The Socialist Republic of Vietnam, 2021b). Wage increases are also promised based on Notice No. 919/TB-VP dated December 29, 2020, of the Office of

the City People's Committee (European Chamber of Commerce in Vietnam, 2021).

Second, they engage in fiscal policy to support production and business organizations (The Socialist Republic of Vietnam, 2021a), where the government extended several tax deadlines and reduced land rent by 15% (The Socialist Republic of Vietnam, 2020a). Similarly, there is an electricity price reduction (The Socialist Republic of Vietnam, 2021c) and an extended water price reduction for isolated areas until December 31, 2021. Several smaller stimulus checks have been promised: The Socialist Republic of Vietnam (2021b) and HCMC People's Committee (2021c). Support is promised to several key industries to encourage mechanization. The industries targeted are production of automation products, food/beverage products, plastics, and rubbers, information technology (IT), electronics, telecomm, textile, and pharmaceuticals (HCMC People's Committee, 2021a).

Over 1 year after the release of the survey, Vietnam released an extensive "3-in-place" policy based on Resolution No. 88/NQ-CP issued by the Prime Minister of Vietnam Government on (August 12, 2021). Generally, this mandates that employees must work, quarantine, and stay at their place of work for roughly 7-day shifts. Several measures are taken to provide room and board for the employees. Severance packages are offered for employees who are terminated during this period. Firms that fail to comply with this policy must provide transportation to and from work, called "one route, two destinations." These policies were passed on August 12, 2021 (The Socialist Republic of Vietnam, 2021d; Thuy Hang et al., 2021).

Third, health policies are passed to mandate vaccination for employees (July 9, 2021) (The Government News: Vietnam, 2021). Vaccines are provided at zero cost by the State, and enterprises are responsible for negotiating with private or public vaccination units coordinated by the state to organize vaccination. This is intended to eliminate both financial costs and search/informational costs for employees. The state promised to synthesize and immediately publish on the portal the list of people who have been vaccinated on the national vaccination information system. However, overall vaccination rates are low, and some blame the government for being slow to act—particularly while elections are occurring (Abuza, 2021).

Lastly, several commitments are made to increase communication, transparency, and networking opportunities. Several resolutions are made to increase communication and networking for foreign direct investment (FDI) firms. The resolution also proposes to build a transparent mechanism on open data sources in the public sector so that technology enterprises can access digital resources to develop innovative products and services (The Socialist Republic of Vietnam, 2020b).We next describe a theory of firm responses during this pandemic.

3 | THEORY

We propose a simple model of whether or not a firm will declare they have made a response to COVID-19 (such as changing their products). We propose that the cost of declaring a response (c) is directly correlated with the extent of claimed losses and complaints (l), *ceterus*

paribus—it is more important to list a response when a firm lost a large amount and have many complaints. We note that it is particularly important to declare a response has occurred when the complaints are numerous, severe, and exaggerated. Otherwise, the declarations may seem suspicious. At the same time, the probability (*p*) of provoking a government response of value *V* is increasing in the size and number of losses complaints, again, holding the other qualities of the response equal. That is to say, survey respondents solve:

$$max_l : V p(l) - c(l) \tag{1}$$

We recognize these magnitudes are exceptionally modest, and the cost of additional writing or exaggerating a claim of loss is quite small, as is the probability of provoking a response. But these small magnitudes do not invalidate the notion that firms consider them. Making explicit the straightforward assumptions $c'_l > 0$, $c''_l > 0$ and $p'_l < 0$, $p''_l < 0$ lead to a simple optimization rule of the following:

$$V = \frac{c'_l}{p'_l} \tag{2}$$

Here, we note that *V* must be substantive; for example, any government response would be worth nonzero dollars.

Since the cost of exaggerating a complaint is fairly small in most contexts, then the ratio $\frac{c'_l}{p'_l}$ must be one appropriately characterized by an extremely small marginal probability of improvement. In other words, since c'_l is extremely small, p'_l (as suspected) must also be similarly small to produce a nontrivial *V*.
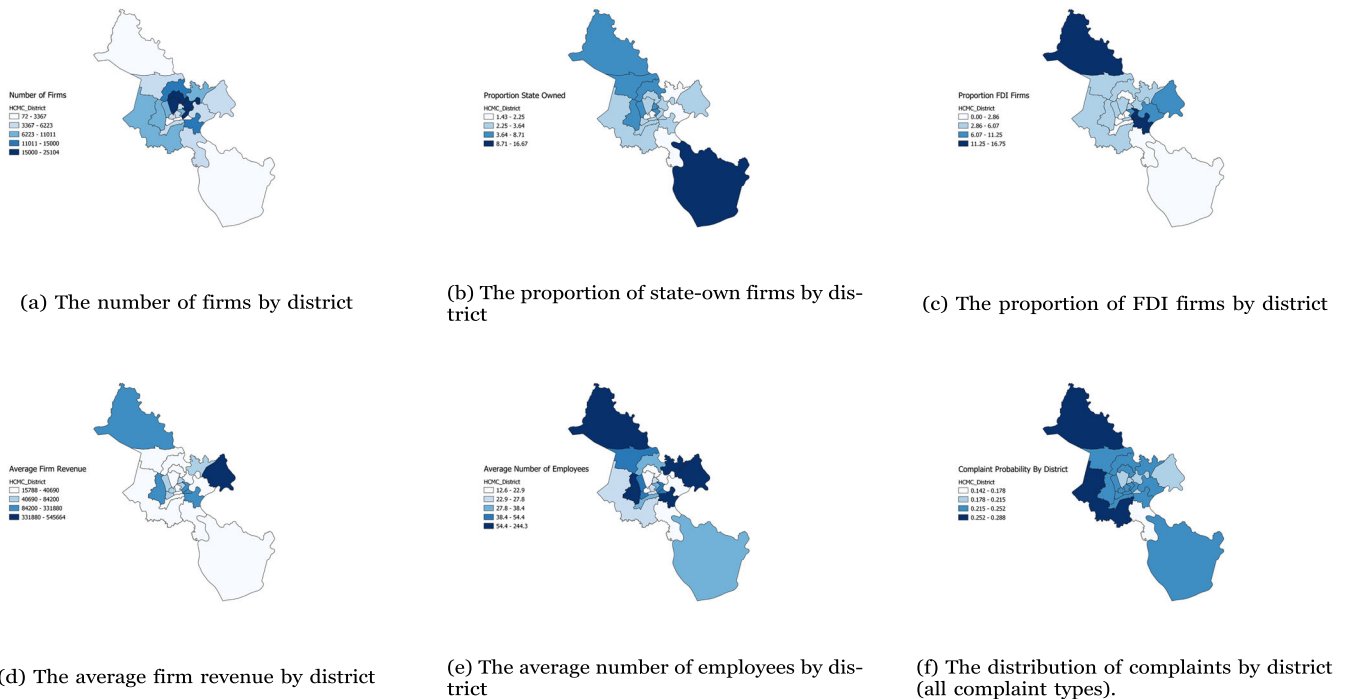
We then look at this model and ask what could motivate particular firms to over or understate claims. Primarily, larger firms and government-supported firms are likely more influential and have larger p'. They are likely more able to elicit a response from the government in general (both through surveys and through direct lobbying). We show evidence they tend to make more claims using the data collected by the Government Statistics Office below in Section 6, though we cannot verify if these claims are overstated.

4 | DATA

Our data are retrieved from the large-scale survey conducted by the General Statistics Office of Ho Chi Minh City (Vietnam) for 16,300 firms in all industrial sectors.

We focus on the response of firms (changing of products, seeking out new markets, etc.), in response to problems they faced during the pandemic, as predicted by the complaints the firms made during the survey.

Here, we summarize the key features collected about the firms, the type of complaints firms could select in the survey, and the types of responses firms could indicate they chose in the survey. Figure 1a indicates the geographic distribution of these firms. Naturally, we found that firms are likely to be located in the city centers namely District 1, 3, 10 or Tan Binh District, Phu Nhuan District, Go Vap District, where they can benefit from the modern infrastructure. In contrast, the rural areas, representing the outside of city centers, are less attractive to enterprises and are therefore less densely populated

(a) The number of firms by district

(b) The proportion of state-own firms by district

(c) The proportion of FDI firms by district

(d) The average firm revenue by district

(e) The average number of employees by district

(f) The distribution of complaints by district (all complaint types).

FIGURE 1 Geographic dispersion of firm complaint determinants. (a) The number of firms by district. (b) The proportion of state-owned firms by district. (c) The proportion of FDI firms by district. (d) The average firm revenue by district. (e) The average number of employees by district. (f) The distribution of complaints by district (all complaint types)

by firms. The next two Figure 1b and c offer insights into the distribution of firm types across the districts. Accordingly, the density of SOE focuses on the city periphery including Cu Chi District, Hoc Mon District, and Can Gio District. Higher counts of SOEs are strongly correlated with lower land prices. Ho Chi Minh City has two land-price framework only partially governed by market principles Thu and Perera (2011), but the cheaper parcels of land in rural areas are still more appealing to locate the state-owned firms.

Finally, Figure 1d and e show the firm size as measured by the number of employees and by the average revenue in 2019, respectively. We observed that District 7, District 9, Can Gio District, Cu Chi District, and Binh Tan District tend to have firms with more employees than the other regions. Appropriately, these aforementioned districts and towns also have industrial parks which employ the majority of workers. Meanwhile, the city center is the place for both clerical workers and vendors in tourism to work and do business. These two maps also match the densities for the urbanization in the industrial ecosystem in the previous empirical study of le Vo (2007). Last we show the spatial distribution of complaints—except for District 9 and Can Gio District, the remaining areas issued numerous complaints to the governments in Figure 1f.

Our questionnaire covers the main question "Which problems are your company facing on the onset of COVID-19 in Ho Chi Minh City?" and the following translated complaints:

1. The lack of capital.
2. The shortage of resources of materials in the country.
3. The shortage of resources of imported materials.
4. The shrink of the domestic consumption market.
5. Manufactured goods cannot be consumed domestically.
6. Manufactured goods cannot be exported.
7. Cannot do business activities as normal.
8. There is no revenue to cover expenses.
9. The revenue is not enough to cover expenses.
10. Cannot recruit or having to cut down labor.
11. No difficulties.
12. Other detailed problems (with open answer).

To cope with the above problems, there are several responses that firms carry out:

1. Fostering e-commerce.
2. Changing the primary product.
3. Applying training and coaching process for employees.
4. Finding the new markets for input.
5. Finding the new markets for products, apart from the traditional markets.
6. Other detailed solutions (with open answer).

Other relevant characteristics firms were collected, and we display these summary statistics in Table 1, along with the firm responses and firm complaints.

TABLE 1 Summary statistics

Statistic	Mean	SD
Number of employees	44.02	607.39
2019 revenue (million dong)	70,104.79	1,047,036
Revenue change	40.57	36.06
Decline in revenue (%)	13	29
Firm responses (%)		
Change product	19	39
E-commerce	33	47
New Market: Product	34	48
New market: input	17	38
Other response	13	34
Training labor	16	37
Firm complaints (%)		
Shortage capital	32	47
Shortage imported materials	12	32
Shortage resources	9	29
Domestic consumption down	42	49
Cannot consume: domestic	13	34
Cannot consume: export	5	21
Cannot do Business	36	48
No revenue	31	46
Insufficient revenue	43	50
Labor shortage	22	41
No difficulty	22	41

Note: Number of firms: 16,302.

Broadly the average firm has just over 44 employees, but this is due to a modest number of very large firms, as indicated by the large standard deviation of 607. Similarly, the average firm has revenues of 70,104 million dong or about 3.05 million USD. Again, this is influenced by a few high-performing firms, such as Vinamilk (a dairy company) and the Petrovietnam gas Joint-Stock Company. However, this strong right skew is typical for firm size and well established in the literature Axtell (2001). The average firm reports a 13% decline in revenue relative to 2019 during the pandemic, though this will vary by firm type. Some firms report losing 100% of their revenues, which is possible, but we are acutely aware that some firms may simply be providing hyperbolic responses. Similarly, we note that some firms self-reported as having had no revenue in 2019 and yet reported a decline in revenue in 2020 so we calculated *Decline in Revenue*/2019 *Revenue* + 1 100% to retain the notion that their revenues have been reduced to nothing without sacrificing the observation. Since, unavoidably, some firms report implausible losses in this area, this category has been constrained to an upper bound of 100%.

Most firms have elected to seek out new product markets (34%), and in this paper, we seek to determine if this response (or others) is associated with the complaints firms have issued or other characteristics of the firm. The most common complaint of firms is insufficient revenue (43%), which is an obvious first-order concern for firms. Still, it is clear that there is not a one-to-one relationship between

insufficient revenue and seeking out new product markets, so this calls for further research.

In Figure 2, we show the correlation between firm COVID-19 responses to provide an overall view of the data. The first pattern of note is the obvious negative correlation between "Other Response" and the enumerated firm responses. That is to say, typically firms marked "Other Response" when their choices did not reflect the remaining options on the survey. We found a positive correlation between nearly all the remaining categories, meaning that firms that applied one solution tended to apply others. The only exception is new product markets, which tended to be used less frequently when firms were training labor, though this correlation is very weak (.01). This negative association makes sense if one imagines that decision making is costly, and certain firms prioritize production first, and the identification of customers is prioritized second Salamone et al. (2018). The strongest positive correlation (+.22) is between seeking out new product and input markets, possibly because the search costs for new markets are complementary or because the products that need to be moved tend to be ones where all elements of the supply chain have been disrupted.

5 | METHODOLOGY

5.1 | Regression models to predict word counts

To predict the probability of a complaint, we use a traditional Probit model, so we can easily ascertain the estimated marginal relationship between the firm characteristics and the probability of a particular response to COVID-19. The estimating equation is as follows:

$$\begin{aligned}Y_{rf} = \Phi(&\beta_0 + \alpha_r + \delta_1[Complaint\ Type]_f + \delta_2[District]_f + \delta_3[Industry]_f \\ &+ \delta_5[Firm\ Type]_f + \beta_6 Number\ of\ employees_f + \beta_7 2019Revenue_f \\ &+ \beta_8\% Decline\ in\ Revenue_f \\ &+ +\delta_6[[Response\ Type] * [Complaint\ Type]]_{rf} + \epsilon_{rf})\end{aligned}$$

(3)

Here, [x] indicates a vector containing the factors of x. Y_{rf} is 1 if a firm (f) says they have made a particular response (r) and 0 otherwise. We use a Probit estimation (Φ is the normal cumulative distribution function [CDF]) to calculate the coefficients of interest. Since each firm is asked about 6 different responses, α_r is a fixed effect for 5 types of questions (excluding "Other" as a base). Complaint Type is a factor for each of the 11 types of complaints, excluding the nonspecified "Other" as a base. Firms can have multiple complaints which we anticipate influencing their tendency to issue all of the responses, measured by the vector δ_1, which has one coefficient for each of the 11 types of complaint. In our final specification, we interact these two ([[Response Type] * [Complaint Type]]$_{rf}$) to determine the association between each type of complaint (11) and each type of firm response (6), for a total of 65 different factors (11 * 6 − 1 = 65).[2] The vector of coefficients δ_6 measures how a particular complaint is associated with an increase (or decrease) in the probability of a particular response. District are factors for each of the 25 possible firm's districts within HCMC (excluding 1 as the base level). Industry fixed effects are factors for each of the 82 detailed industry codes classifying the firm's product (excluding 1 as the base level), though we sometimes simplify this by breaking

FIGURE 2 Correlation between firm responses

out manufacturing separately. *Firm Type* indicates if a firm is state-owned (SOE) or established with FDI. The *Number of Employees* and *2019 Revenue* account for the firm's size. For these two variables, we use normalized values to help simplify the interpretation of the marginal effects.[3] We also calculate the percentage change in revenue relative to the 2019 revenue and include this as a predictor, since firms may respond to proportional losses in revenue rather than simply absolute levels.

6 | RESULTS

Evidence suggests firm suffering is nearly ubiquitous during the downturn, with only 14% of firms reporting having no difficulty. In this survey, about 30% of firms reported a loss in revenue. On the other hand, about 2% of firms have reported large reductions of nearly 60% of their annual revenue, even when excluding potentially misreported incomes.[4] Comparatively, the current literature indicates that about 40% of U.S. firms reported no positive growth in sales during the pandemic time (Bloom et al., 2021).

In Table 2, we use Equation 3 to examine which firms have issued a response to COVID-19 and which types of responses are typically issued.

First, in Table 2, column 1, we look at the association between response and the characteristics of the firm, beginning with technology and manufacturing firms. Technology firms have no significant difference between themselves and the baseline firms, though the coefficient is negative suggesting they are somewhat less likely

TABLE 2 Predicting firm response using firm complaints and characteristics

	(1)	(2)	(3)	(4)
Firm characteristics				
Technology firm	−0.201 (−0.54)			
Manufacturing firm	0.160*** (12.88)			
SOE	0.157*** (6.48)	0.159*** (6.46)	0.1506*** (5.96)	0.1597*** (6.21)
FDI	0.0341 (1.82)	0.0234 (1.22)	0.0066 (0.33)	0.0065 (0.32)
Number of employees (Z)	−0.00214 (−0.47)	−0.00216 (−0.47)	−0.0021(−0.42)	−0.0023(−0.46)
2019 revenue (Z)	0.0229** (4.62)	0.0213*** (4.29)	0.0155** (3.22)	0.0171*** (3.37)
% decline in revenue	0.00195*** (12.74)	0.00198*** (12.87)	0.0014*** (8.89)	0.0014*** (9.06)
Firm firm responses				
Change product	0.234*** (13.85)	0.231*** (13.67)	0.233*** (13.26)	
E-commerce	0.691*** (42.92)	0.689*** (42.78)	0.735*** (43.68)	
New product market	0.730*** (45.41)	0.727*** (45.22)	0.778*** (46.20)	
New input market	0.175*** (10.24)	0.169*** (9.91)	0.161*** (9.04)	
Training labor	0.136*** (7.92)	0.134*** (7.83)	0.129*** (7.25)	
Firm complaints				
Shortage capital			0.0845*** (8.07)	
Shortage imported materials			0.160*** (11.05)	
Shortage resources			0.198*** (12.33)	
Domestic consumption down			0.134*** (12.85)	
Cannot consume domestic			0.126*** (9.07)	
Cannot consume export			0.132*** (5.98)	
Cannot do business			0.0227* (2.17)	
No revenue			0.0376*** (3.50)	
Insufficient revenue			0.0693*** (6.83)	
Labor shortage			0.0614*** (5.30)	
Constant	−2.232*** (−4.54)	−2.181*** (−4.43)	−2.2487*** (−4.52)	−1.7787*** (−3.57)
N (responses × Firms)	97,812	97,812	97,812	97,812
Firms	16,302	16,302	16,302	16,302
Responses	6	6	6	6
Complaint × Responses	NO	12 NO	NO	YES

Note: t statistics in parentheses. Complaint and Response interactions are examined in detail within Table 3.
*p < .05. **p < .01. ***p < .001.

to declare a response. Manufacturing firms, on the other hand, are significantly more likely to declare they have responded to COVID-19, with a significant average marginal effect (AME) of about 5%. This coincides with the difficulties manufacturing is having during this period (Ding et al., 2021; Rapaccini et al., 2020; Walmsley et al., 2021).

Firm composition also is associated with COVID-19 response. In Section 3, we outlined that SOE and larger firms are presumably more likely to provoke a government response, and as a result, they are more likely to complain. We find that SOEs are indeed significantly more likely to respond to the crisis, and the significant AME suggests 5% more likely to respond than standard firms. FDI firms are not significantly more likely to respond than standard firms. The coefficient is small and insignificant, and the AME only measures that these firms about 1% more likely to respond at a significant level of 10%.

Importantly, we find firms with reduced revenue are more likely to respond, and a 1% decline in revenue is associated with a significant .05% increase in the probability of invoking a COVID-19 response. In line with our theory, firms with more revenue are also significantly more likely to respond (about 0.6% more likely to respond for each 1 SD increase in revenue), though this is not similarly true for firms with more employees, suggesting that that high-revenue but small firms are most influential.

Next in Table 2, column 2 includes fixed effects for each of the 82 industry types, excluding a base of the wholesaling industry, the largest single industry type which represents over 25% of industries in HCMC. These more detailed fixed effects generally leave the coefficients of interest essentially unchanged. The coefficient on SOE remains of similar magnitude and retains its significance. The association between FDI and COVID-19 response remains near zero and insignificant. Similarly, the coefficients on employees, revenue, and percent decline in revenue retain their direction, general magnitude, and significance.

Then Table 2, column 3 includes fixed effects for each type of complaint, allowing us to find and estimate to what extent particular complaints are associated with a response to COVID-19. The complaint that most frequently is associated with a response is a shortage of resources. Firms that complain of a shortage of resources are a significant 6% more likely to report a response to COVID-19. The next most relevant complaint is a shortage of imported materials (arguably somewhat of a subset of the previous complaint), which is associated with a significant 5% increase in likelihood to report a response to COVID-19. In fact, all of the possible complaints are associated with positive and significant increases in COVID-19 response likelihood— but this merely identifies that firms that issue complaints are also likely to issue a response.

Finally in Table 2, column 4, we explore this connection between firm complaints and firm response in greater detail. We consider an interaction between each type of complaint and each type of COVID-19 response. This interaction term accounts for the idea that some firm complaints are more likely to be associated with a particular type of firm response. For example, a firm that complains of a labor shortage is more likely to have a response of training labor but unlikely to

have the response of seek out new markets to sell their products. Column 4 of Table 2 begins by showing an essentially unchanged association between firm characteristics and probability of firm response, though SOEs are slightly more likely to issue a response after accounting for interaction effects between complaints and response type. Since we cannot fit all (11 * 6 − 1 = 65) base levels and interactions in Table 2, Table 3 shows the estimated coefficients and standard errors for all of these base levels and interaction effects. In Table 3, each row contains a response, each column is a complaint a firm may have. The coefficients in each cell measure the association between the complaint and the response after controlling for the other factors in Table 2, such as firm size, ownership type, and industry.

In Table 3, row 1, we show which complaints are associated with a COVID-19 response of "Change Product." Generally, we see that firms who complain about other, manually entered problems are significantly less likely to change their product. But firms that experienced shortages of any type (capital, materials, resources) or had a decline in domestic consumption (either an inability to consume or a simple reduction) tended to be likely to change their product. Firms that complained of revenue shortfalls (no revenue or insufficient revenue) also were likely to change their product in response.

In row 2, we consider which complaints are associated with firms seeking out opportunities to expand via e-commerce. Most complaints are associated with a significant increase in e-commerce, especially a decline in domestic consumption. However, for those firms which complain that they export products that could not be consumed or firms that complain they cannot do business at all, these firms were significantly less likely to seek out e-commerce opportunities.

We consider new product markets in row 3, which bears some similarity to e-commerce—one could consider online markets as new markets. Similar complaints are associated with both responses, with some exceptions. Firms were significantly more likely to seek out e-commerce or new product markets if they complained of domestic consumption declining. This seems intuitive that firms with substantive investments in making a particular product would seek other customers for that product during hard times. Firms were significantly less likely to seek out e-commerce or new product markets if they complained of being unable to do business. However, e-commerce and new product markets differed in two areas. First, firms tended to seek out new product markets and *not* new e-commerce markets when their targeted export market cannot consume their product, and the difference between the two is strongly significant. This may be because international shipping arrangements can more easily pivot to a country that is allowed to purchase the product.

Complaints associated with seeking new input markets are examined in row 4, distinct from product markets. Still, many of the same complaints are associated with seeking out both new input markets and new product markets. The major distinctions are that firms which have other complaints are significantly less likely to seek out new input markets. We attribute this to the survey itself, which contains two categories that directly address input shortages and are strongly predictive of seeking out input markets—"Shortage: Imported Materials" and "Shortage:Resources," both of which make it extremely

TABLE 3 Interaction terms between firm response and firm complaint

Firm response	Complaint(s) issued					
	Omitted Complaint (base)	Shortage: Capital	Shortage: Imported materials	Shortage: Resources	Domestic consumption Down	Cannot consume: Domestic
Change product	−0.340*** (−10.60)	0.325*** (8.23)	0.398*** (6.56)	0.237*** (3.62)	0.431*** (11.52)	0.327*** (5.94)
E-commerce	0.197*** (6.76)	0.282*** (7.39)	0.421*** (7.12)	0.262*** (4.13)	0.515*** (14.47)	0.318*** (5.94)
New market: Product markets	0.0677* (2.28)	0.224*** (5.78)	0.309*** (5.18)	0.452*** (7.09)	0.897*** (25.02)	0.741*** (13.75)
New market: Input markets	−0.501*** (−14.78)	0.256*** (6.26)	1.155*** (19.36)	1.106*** (17.35)	0.437*** (11.28)	0.418*** (7.52)
Training labor	−0.325*** (−10.06)	0.366*** (9.12)	0.586*** (9.62)	0.298*** (4.54)	0.206*** (5.42)	0.252*** (4.49)
Other: binary	-	−0.108*** (−3.57)	−0.296*** (−6.01)	−0.142** (−2.73)	−0.169*** (−6.02)	−0.199*** (−4.55)
(base)	-					

Firm response	Complaint(s) issued				
	Cannot consume: Export	Cannot do Business	No Revenue	Insufficient Revenue	Labor Shortage
Change product	0.0704 (0.86)	−0.00690 (−0.19)	0.131*** (3.33)	0.256*** (6.84)	−0.00328 (−0.08)
E-commerce	−0.172* (−2.14)	−0.135*** (−3.79)	0.0632 (1.66)	0.291*** (8.15)	−0.0418 (−1.01)
New market: Product markets	0.591*** (7.31)	−0.339*** (−9.38)	−0.119** (−3.08)	0.409*** (11.36)	−0.131** (−3.11)
New market: Input markets	0.275*** (3.36)	−0.354*** (−9.07)	0.107** (2.60)	0.267*** (6.89)	−0.102* (−2.28)
Training labor	0.0520 (0.63)	−0.273*** (−7.18)	0.107** (2.66)	0.249*** (6.54)	0.283*** (6.55)
Other: Binary (base)	0.0826 (1.30)	0.333*** (12.13)	0.0612* (2.06)	−0.0650* (−2.33)	0.0960** (2.96)

Note: t statistics in parentheses. Each of the coefficients represents an additional interaction term between issued firm complaints and firm responses, referenced in Table 2.

*p < .05. **p < .01. ***p < .001.

likely a firm would seek new input markets. Firms that seek new inputs likely mark these categories directly and have no need for write-in information in the "Other" complaint category.

Complaints associated with labor force training are examined in row 5. Intuitively, labor force training is well predicted by firms indicating they are having labor shortages. Firms are significantly less likely to bother training their labor forces if they complain of a general inability to do business—these firms may be downsizing. Less obviously, however, firms are significantly more likely to train their labor force when they are having a shortage of imported materials or resources. This suggests substitution between inputs—firms may be training workers to be more conservative with inputs.

Finally, row 6 examines "other" responses, for which we do not have a strong a priori intuition as to which complaints will be associated with this response. However, the coefficients suggest firms are likely to seek out other, varied responses when they cannot do business. These firms may be particularly desperate and seek unique or innovative solutions that are not listed in the survey.

7 | CONCLUSION

Vietnam is still a developing country. However, they have shown remarkable insight by completing a comprehensive census of all major businesses in the capital city. This survey represents a unique opportunity for self-reporting and a detailed discussion of problems during COVID-19 from the perspective of the firm. We found several unique patterns in the survey suggesting general patterns in firm characteristics and firm responses. At the same time, we have documented several elements of the Vietnamese experience and the circumstances that make the COVID-19 case in Vietnam unique.

Generally, SOE, high-revenue firms, and firms with large declines in revenue were significantly more likely to respond to the pandemic with one of the listed responses. This is particularly unusual because high-revenue firms and SOE are generally perceived as less agile (Chen & Hambrick, 1995; Song et al., 2011), but these firms are significantly more likely to have declared a response to the pandemic. We attribute this partially to a tendency for these firms to be more able to provoke potential government responses. This means there is an increased benefit for adding further complaints and declaring additional responses, resulting in these firms having an outsize number of responses relative to non-SOE and low-revenue firms.

Furthermore, the specific complaints firms issued were significant and strong indicators of the responses of each firm. We stylize the major complaints which indicate a particular firm response below:

1. Change product: Firms tended to change their product when complaining about either input shortages or declines in sales and therefore revenue.
2. E-commerce: Firms tended to seek out e-commerce if sales or revenue declined or if there was a shortage of imported materials.
3. New product markets: Firms tended to overwhelmingly seek out new markets when domestic consumption declines.

4. New input markets: Firms overwhelmingly seek new input markets when complaining about resource or materials shortages.
5. Training labor: Firms seek to train new labor when facing labor shortages or (less obviously) when facing shortages of imported materials suggesting substitution between labor and other inputs.
6. Other responses: Firms tend to seek out other responses when they cannot do business.

This information is useful for researchers looking to anticipate firm transitions and changes during this or future pandemics. At the same time, these regression results represent a quantitative tool to highlight particularly unusual firm expenditures during the COVID-19 pandemic—such as estimating the probability that a particular firm began training labor when that firm cannot do business. Such a tool may have use after the pandemic in order to examine fraud.

Our study has a caveat due to its position as a preliminary survey conducted by the government, where several follow-up surveys are planned. However, these results are still critical because many firms will be restructuring their business (Kottika et al., 2020) as a natural response to stressors during the COVID-19 pandemic. Since the COVID-19 outbreak is not yet resolved and vaccine distribution is still on the horizon for many developing countries, these industry shifts are still ongoing. Therefore, future research and current policy may benefit from capitalizing on current survey data to stay relevant during this rapidly changing COVID-19 period.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

ENDNOTES

[1] Altig et al. (2020) explored that the U.S. economic growth (proxied by GDP) fell 11.2% from the last quarter in 2019, the second-largest drop since the Great Depression. In addition, the GDP of Great Britain dipped by 2.2% in the first quarter of 2020 and 20.4% in the following quarter.

[2] These are too numerous to include with the remaining regression results and for this reason are placed separately in Table 2b.

[3] Calculated by $\frac{value - mean}{standard\ deviation}$, logs are not an option due to the nontrivial number of zeros.

[4] When observing the data directly, as many as 10% of firms report losses as large as 60% of their revenue—however, 8% firms appear to have misreported their income leaving only about 2% facing such dramatic losses in revenue.

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